$$\operatorname*{Lim.}_{x=0}\left(\frac{\tan x}{x}\right)^{1/x^n}=\operatorname*{Lim.}_{x=0}\left\{\left[1+\frac{x^2}{3}\left(1+\varepsilon\right)\right]^{\frac{3}{x^2(1+\varepsilon)}}\right\}^{\frac{1+\varepsilon}{3x^{n-2}}}=e^{\operatorname*{Lim.}_{x\doteq 0}\frac{1+\varepsilon}{3x^{n-2}}}$$

$$=\left(\varepsilon^{\frac{1}{3x^{n-2}}}\right)_{x=0}.$$

This has the advantage of being a direct, closed expression, which shows at once the particular results, 1, $e^{\frac{1}{3}}$, ∞, when n equals 1, 2, $2+r$, where r is any positive integer, and also the general law for any value of n, of whatever character it may be.

MECHANICS.

73. Proposed by J. K. ELLWOOD, A. M., Principal of Colfax School, Pittsburg, Pa.

A sixteen foot plank weighs thirty-two pounds and is supported by two props, four feet and two feet from the ends. What weight is supported by each prop?

Solution by C. HORNUNG, A. M., Professor of Mathematics, Heidelberg University, Tiffin, Ohio; P. S. BERG, B. Sc., Principal of Schools, Larimore, N. D.; J. SCHEFFER, A. M., Hagerstown, Md.; CHARLES C. CROSS, Libertytown, Md.; ELMER SCHUYLER, High Bridge, N. J.; A. H. BELL, Hillsboro, Ill.; CHARLES E. MEYERS, Canton, O., and M. A. GRUBER, A. M., War Department, Washington, D. C.

Let x=the number of pounds supported by the prop four feet from the end. Then taking moments around the other point of support, we have:

$$(6+4)x=6\times 32, \text{ or } x=19.2 \text{ pounds.}$$

The other prop supports $32-19.2=12.8$ pounds.

Also solved by *G. B. M. ZERR*.

74. Proposed by B. F. FINKEL, A. M., M.Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

In the experiment of swinging in a vertical circle a glass containing water, and suspended by means of a string, if the string be two feet long, what must be the velocity at the lowest point if the experiment is to succeed? [From *Ziwet's Theoretical Mechanics*, Part III., p. 96.]

Solution by the PROPOSER.

Let M=the mass of the glass and water, f=the centrifugal force, r=2 feet =radius. Then $f=Mv^2/r$.

At the highest point, in order that the experiment may be successful $f=Mg$. $\therefore Mv^2/r=Mg$, whence $v=\sqrt{rg}$.

The velocity, v_1, due to gravity in passing from the highest to the lowest point is $v_1=\sqrt{(2gs)}$, where $s=2r$.

Hence, the velocity, v_2, at the lowest point is,

$$v_2=\sqrt{(v^2+v_1^2)}=\sqrt{(rg+2gs)}=\sqrt{(321.6)}=17.94 \text{ feet per second,}$$

g being equal to 32.16.

Also solved with slightly different results by *G. B. M. ZERR*, and *CHARLES E. MEYERS*.